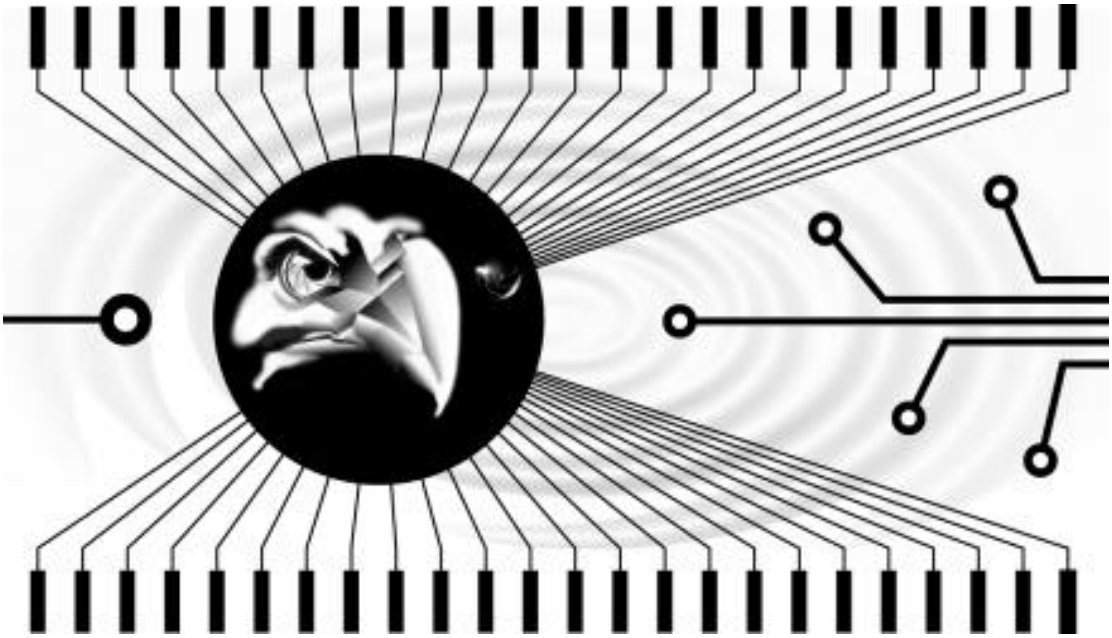

" . . . OR GO DOWN IN FLAME?"

TOWARD AN AIRPOWER MANIFESTO FOR THE TWENTY-FIRST CENTURY

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TO LEAD IS to choose. Choosing commits one's group to courses of action and to consequences. In 1995 the leaders of the United States Air Force asserted that long-range planning in the Air Force was "broken" and that they would fix it. Doing so requires vision, a sense of the evolving environment, and a process for linking visions to strategies and tasks. Bureaucracy without vision mistakes activity for progress. Vision without the wherewithal for change is called dreaming.

Today, planning matters because the Air Force, in our view, is poised between two courses—one to "live in fame," the other to "go down in flame," as the Air Force song goes. Bad choices forebode institutional irrelevance or, worse, disintegration and defeat. Some people may find

contemplation of a future without an Air Force to be a distraction, a waste of time, or a logical impossibility. But it is none of those.

Why Change?

By now it is hardly news that the whole Department of Defense must come to grips with two fundamental discontinuities. The first involves the "why" of military power in the wake of the fall of the Berlin Wall. No one knows whether "history"—the domination of world politics by great power struggles—has ended, simply taken a breather, or is in the process of transformation. Thus, it ill behooves the United States and its armed forces to await history's return lying down. As nettlesome as today's challenges are, it is difficult to see any circumstances under which the reemergence of a hostile great power would enhance the national security of the United States. In the cold war, the Air Force used bombers and ballistic missiles to help deter its going hot. Today's environment mandates that we rethink the capabilities required to deter tomorrow's great powers from hostile postures.

Today, planning matters because the Air Force, in our view, is poised between two courses—one to "live in fame," the other to "go down in flame."

The second involves the "how" of military power in the enveloping onrush of information technology. Simply put, "being digital," to use Nicholas Negroponte's meaning of the new ontology, means that the high ground is no longer aerospace, in and of itself, but cyberspace.[1] Understood in its broadest terms, cyberspace is the great confluence of all the various bits and information streams that, together, generate the strategic "top sight" prerequisite for victory.

By history, predilection, and structure, top sight seems the natural domain of the Air Force—but only if chosen and commanded. To do this, the Air Force first needs to redefine itself from an atmospheric institution to an infospheric one. This is the soul of our manifesto, and our essay now turns to envisioning and guiding this transformation.

To understand the implications of such a change for the Air Force requires starting from first principles. The mission of the Air Force is not merely what it does (tending to air and space operations) but what it contributes (determining how to operate for strategic effect). Knowing how to transport mass or energy to targets—plinking tanks or flattening cities—has its time and place. Yet, it is but a subset of knowing how to get and use knowledge to confound or terminate the production, distribution, and, increasingly, control of all sources of opposing military strength. Technology permits us to achieve ends—strategic superiority—through many means: space-based, atmospheric, ground-based, and maritime systems, both manned and unmanned. If a separate Air Force exists for strategic purpose, then information, rather than any one attack method, becomes central—hence, a rationale for the Air Force to drop its atmospheric orientation in favor of an infospheric one. Just as the Air Force was born to exploit the technology of flight, so must it evolve to reflect subsequent technologies of equal strategic heft. Our notions of the high ground must change, as airmen accept the coup d'oeil as the peer to and the enabling means for the coup de grace.

The Air Force was founded on the principle that mastery of the new technology would allow a nation to leap over World War I's bloody stalemate and strike a strategic blow to the enemy's war-fighting machine. Air—the atmosphere—became the high ground. Taking it made victory everywhere else only a matter of time and will. It so happened that in the first interwar period (and we may well be in another one), this technology was reified in the manned aircraft, since only the human body had the sensors and computing power needed for airpower's chores. But technology is protean by its very nature, and, as Operation Desert Storm was the first to demonstrate, the information realm is becoming tomorrow's high ground. Simply put, if you can see the enemy and the enemy cannot see you, then only

modest applications of precisely aimed and correctly timed force suffice to command the battle space. It is this ground that the Air Force must seek to command.

Before examining the transition from an atmospheric to an infospheric force, fairness requires that we note two alternative visions—the "constabulary" Air Force and the Air Force that wages information warfare. Both capabilities—one based on conducting peace operations and the other on targeting enemy information systems—seem new and valid tasks. Neither, however, provides a reasonable heart and soul for tomorrow's Air Force.

The constabulary Air Force—so brilliantly elucidated by Carl Builder—is, nevertheless, highly problematic. Very little force is left; "food bombs" on friends may be necessary, but hardly suffice for strategic leverage against enemies. It provides little insurance against the reemergence of serious great-power rivals. A weakened constabulary Air Force might even summon such fools forward. Once alienated from its core focus, the air constables may not be able to recover if history returns.

Adopting the trendy profundity and modernity of information warfare as a primary mission is often (wrongly) read into *Cornerstones of Information Warfare* (1995), the Air Force statement on the subject. Yet, discipline and causality in the grinding application of power—not inscrutability or novelty—distinguish warfare from brawling or from fancy. Strategic information operations—the unleashing of viruses, worms, Trojan horses, and others of that seemingly magic (or perhaps mythic) menagerie described by Doug Waller in *Time*—tend to reach their highest utility against enemy national infrastructures just prior to conflict. This fact alone should suggest wariness in putting any military in charge (and even more so for strategic information defense). At the operational level, no one really knows how much good—let alone bad—information attacks can do. Such operations are opportunistic and thus antithetical to an ethos built on strategy-to-task generation. Foes without an information infrastructure to disrupt may leave such a redefined Air Force with nothing to do.

The Air Force as a Joint Force

How does our vision of seizing and controlling the high ground harmonize with the vision of the other services and the Joint Staff? The latter's *Joint Vision 2010* was designed to scan the strategic horizon, promote joint force, and thereby inform the "visions" of the separate services. It seeks virtue in unchangeable aspects of fighting. Will there be precision strike in the future? Yes. Will one side strive to have greater awareness than the other? Of course. Wouldn't it be efficacious if joint forces could envision and engineer the dominating maneuver of full-spectrum dominance? Absolutely. Does focused logistics facilitate resupply? Unremarkably so. Alexander, the Great Khan, and Napoléon would applaud these attributes, finding them familiar.

What is left unsaid, though, matters more. Neither legislation nor downsizing makes jointness necessary, so much as the tendency of every service's target acquisition and prosecution systems to overlap. Title 10 federates the armed forces, while the battle space is as indivisible as the cyberspace. It can no longer be divided into neat domains and parceled out to each service to fight its own war—the Navy in the littoral, the Army in the fields, and the Air Force high and deep. They just keep getting in each other's way.

A future Air Force cannot help envisioning the totality of the joint and integrated armed forces. At the heart of this joint vision is likely to be a vast, interconnected, interoperable, and ultimately integrated metasystem (a "system of systems" or, farther on, an "organism of organisms") to which all services contribute and from which all of them draw. The metasystem is not the elusive silver bullet or golden BB but the convergent architecture of capabilities nurtured by deliberate planning. It will not be a single machine or even a single network, but its users will not care—as far as they are concerned, it will be the common instrument with which they all go to war. Feeding it will be rules of engagement, commanders' intents, strategic intelligence, bit streams from space, continuous logistics reports, status of forces, weather observations, sensors from every-

where, operator inputs, and even the output of global news networks. It will supply the raw material of nearly total situational awareness, from global overlay to designated targets. If the metasystem is to do serious work, we have to plan it, from the start, as an integrated system, even though initially composed of legacy devices and code. We cannot simply glue today's increasingly inadequate systems at their edges and be done with them. Such a conceit grossly understates both the requirements for real-time battle-space control and the degree to which technology can empower greater vision. In the end, someone must be in charge of building and maintaining the metasystem for whoever is asked to command it. Who better than the Air Force? It was the Air Force's *Spacecast 2020* that introduced the notion of "global view" and the institutional pronouncement of a new and virtual form of engagement in "global presence" that followed in hot pursuit.

It is not for the Air Force to populate the entire metasystem—an organic construction of various pieces being built, tested, used, refined, reused, swapped out, and retired in their turn. What the Air Force must do is envision its architecture (and all that implies: requirements, doctrines, tests, protocols, agents, and objects). Once that is well understood, the metasystem will grow naturally—with the Air Force vision of top sight the ghost in the machine. Guardianship over the metasystem is the aspect of controlling and exploiting the high ground that differentiates a next-generation infospheric Air Force from an Air Force frozen in the complacent amber of slightly faster, slightly stealthier atmospheric operations. An infospheric Air Force possesses capabilities that lock out all competitors and make their air and surface forces noncompetitive with ours.

An "armed" force with information but no means to convert it into striking power, needless to add, is pointless. The best "OO" (observe, orient) does not obviate the need for "DA" (decide, act). The metasystem informs command; it does not replace it. Operators are still in charge, and the Air Force will get its fair share at the top. As for weapons, an infospheric Air Force must nevertheless be armed. For tomorrow's evanescent battlefield, we may need faster means of energy delivery, lest targets disappear before energetic force can engage them. Tomorrow's Air Force can and ought to listen to its visionary operators and scientists and engineers: seek real-time engagement weapons ranging from lasers to neutral particle beams and high-powered, focused microwaves. Indeed, the need for fast sensor-to-shooter coupling, consistent with reifying information, calls for the Air Force to strengthen its command over strategic (not just nuclear) weaponry, particularly that closely linked with the metasystem itself.

Tomorrow's Missions

If jointness provides one leg for tomorrow's Air Force, the emerging mission profile of the US armed forces provides the other. The United States took away four enduring missions from the cold war: strategic deterrence, conventional overseas intervention, guarding the lines of communications, and dissuasion (e.g., air strikes against Libya). Students of the new chaos often add peace operations and support for domestic authorities, but neither may last (one political party does not like doing them, and the other party does not like resourcing them) nor carry much relevance for the Air Force. Technology and today's need to deter and defer major-power rivalry suggest that three new "antiwar" missions, to use Alvin and Heidi Toffler's phrase, will emerge over the next quarter century: extended information dominance, global transparency, and strategic defense.

Technology both permits and requires that information dominance sought by the United States be extended to its friends. Apart from "stealth" (rare, expensive, and always incomplete), tomorrow's battle space will be far more transparent than today's—to both sides. Why? Everything creates a signature of some kind—be it sound, odor, contrail, pressure, movement, or twitches in the geomagnetic environment. Every new bit illuminates the battle space—from discovering the tank in the weeds or the aircraft in the clouds—and the number of bits per buck has

been doubling every 20 months, a trend with at least a decade left. The more bits, the more illumination; a sufficiently dense covering of bits, so to speak, increases the odds that enough of them will land on everything worth identifying. This is not purely a military phenomenon: indeed, the most powerful forces for the generation and dissemination of information include the World Wide Web, cheap and plentiful video cameras, commercial satellites, and do-it-yourself unmanned aerial vehicles (UAV). Exactly *which* capabilities appear *when* can always be debated, but the trend lines are laid in (and may yet be accelerated by fortuitous discoveries here or abroad). To be present is to risk being sensed by one phenomenology or another; the attendant revolution in precision guidance means that to be sensed is to be killed. Thus, to linger transparently is to court death. All this may or may not favor defense over offense (even if movement creates more signature than hiding). It most definitely favors the party that can integrate the various information flows into a coherent picture of the battle space rather than an opportunistic series of isolated appearances.

In this environment, today's platforms simply cannot pass unnoticed en route to or when engaged in tomorrow's major fights. That fact, together with today's public sensitivity to casualties, suggests that sending large numbers of young men and women overseas to war against secondary enemies (those who cannot directly threaten the United States) need no longer be how the armed services always go to work. More and more frequently, greater leverage may come from empowering our allies to fight for themselves, particularly when aided by over-the-horizon applications of energy. Empowering is the key concept; telling our friends the location of enemy targets to within the blast radius of their ordnance permits them to defend themselves against larger foes tied to ancient parameters of force. The means by which friends are so empowered are the very same bit streams that feed the metasystem, only this time packaged for delivery rather than ingested organically—hence, the first mission of extending to friends the information advantage enjoyed by the United States. Should they cease being friends, they cannot drink from this font of information. Without information, they must fight parched and blind.

The global transparency mission naturally follows. The surest deterrence to any nation aspiring to hostile great-power status may be the certain knowledge that it is under continual watch. US power can be, as the Air Force argued, "globally present" even when it appears to be physically detached. Let others so much as open factory doors in the desert, pick up the handset to summon their craft, roll a tank out of its shed onto the road, launch an aircraft out of a runway deep in the forest, and somewhere, somehow, some part of the metasystem knows—and can instantly alert whoever can best bore sight thereto. This knowledge need not be converted always into engagement; its demonstration alone may dissuade. Thus, the second new mission of the armed forces: to endow the instrumented world with a degree of transparency so clear that no country can challenge us in the dark. The evil that lurks in the hearts of humans may forever hide, but not the means to convert evil thoughts into evil deeds. Add to this the instant wherewithal to denude will of means, and ill will becomes an aggravation instead of a threat.

The third mission, strategic defense, flows from the second. Over 90 percent of trying to stop a ballistic or cruise missile is finding it. To an aircraft, a Mach 25 missile is a blur; to a photon, however, it hangs in space. The same metasystem that can arm an ally with information and make the entire world transparent to US power can also sweep the skies for air and space threats and dispatch their coordinates to whatever methods are chosen for their engagement.

Note that none of these new missions have anything to do with the human mastery of flight. . . . It is time for the Air Force, as America's premier technological agency, to move on.

It would be hard to imagine three missions that inherently favor the new Air Force more. This is so not because the Army and Navy are absent—for they do play—but because they reflect the orientation and mythos that have always fueled the Air Force. This is truly cosa nostra—"our thing." Their guiding principles—call them dominating medium, top sight, or campaign planning (warfare as a solvable problem of the systemic application of force to a specific end)—follow directly from the inspiration that sent earlier generations to the flight line. Those who recognize a change in the possibilities and employ it in warfare, observed Douhet, have considerable advantages over those who wait until the power of transformational change is used against them. Note that none of these new missions have anything to do with the human mastery of flight. That was yesterday's problem—and one thoroughly solved. It is time for the Air Force, as America's premier technological agency, to move on.

Implications of an Infospheric Air Force

The test of an organizing principle lies in how well it informs the many decisions an institution as complex and vital as the US Air Force must make. The original theory of airpower did precisely that. It gave the organization its mission, put the mission in the context of the other services, suggested how the mission might be fulfilled, prioritized tasks within the mission, steered acquisition strategy (and so fostered the world's greatest aviation industry), defined the essence of being an airman, and thus contributed to the creation and sustainment of airpower. Today the Air Force wrestles with seemingly intractable existential problems. If today's vision is to be more than words, it must be the basis by which today's issues are reexamined in a new light—one so powerful that it makes the obscure visible and thereby transforms apparent crisis into authentic opportunity.

A vision that does not reflect facts risks becoming illusion. No better example of this law exists than the current F-22 program. To the atmospheric Air Force, the F-22 is a must-have—the next obvious step in a continuous, logical train of sleek machines. The F-22 remains another souped-up, short-range, manned fighter, even if stealthier and laden with more silicon. Perhaps the F-22 can be justified, based on a cold assessment of its costs—which are certainly crowding out many other investments and perhaps opportunities (and in a world where everyone else has given up going against our F-15s, much less F-22s). Perhaps an infospheric Air Force would also buy them. Vision, after all, is the beginning, not be-all, of analysis. But an atmospheric Air Force cannot help buying the F-22, regardless of anything that might be known about the threat.

Whoever would hold the high ground needs to attend to three activities that will or must become the raison d'être of air and space forces: (1) operating militarily in a transparent world, (2) understanding space, and (3) defending the American homeland from aerospace threats. Taken together, these needs are the inescapable facts of the future. They are facts, not problems. A fact is something that cannot be changed. Problems arise from ignoring or trying to alter facts. Air and space forces must focus on the facts of the future and use them advantageously.

First, in a transparent battle space, big things make more kinds of signatures than smaller ones. Encasing a human in the life-support systems necessary to operate in the high atmosphere or in space requires plenty of weight and cube, and even then, such an effort may be frustrated by the high "G" loads necessary for maximum agility. Remove the human body from the cockpit, and combat air vehicles can surge ahead. The effort to put "space-derived data into the cockpit" can be redirected to contribute to other parts of the metasystem more effectively. Data need to go to warheads, not task-saturated humans who also have to worry about staying straight and level, breathing, controlling temperature, urinating, and—more importantly perhaps—being captured and exploited. Once the human is removed, small vehicles can quickly become very, very small and very, very fast and pose new problems to defenders.

Once pilots are understood as information-processing components—the natural tendency of an infospheric Air Force—the rational allocation of these functions between carbon and silicon can proceed apace.

UAVs illustrate some of the difficulties an atmospheric Air Force engenders for force-planning. Just the names of today's models—Hunter, Raptor, Talon, Predator, Dark Star, and so forth—are good clues that, even unmanned, the UAV is meant to fight rather than just see. Dreams of air-to-air combat among UAVs lie just below the surface. At several million dollars each, every aircraft must be increasingly well protected (which adds features, which increases cost, which. . . .). How strange it will seem when someone decides that a $100,000 UAV not only suffices but costs less than the missile otherwise required to shoot it out of the sky. A flock of expendable UAVs would occur far sooner to an infospheric Air Force than it would to an atmospheric one.

Instead of preening for pointless battle, Air Force Space Command ought to pick up its mantle as the premier information force in the world.

Second, whither space? Space operators cannot be happy without some way of emulating their air-combat cousins. Despite however much real importance space holds for air and ground combat, the chances that it can be used as a war-fighting arena, in and of itself, are slight (and was thus, even when the Soviets were around). It is bad enough that such urges feed the usual round of institutional fantasies. But they seriously color the space-faring community's approach to "everyone else's" space assets. The belated discovery that our forces could be imperiled with spacecraft-derived information—Saddam Hussein could have seen the "left hook" coming with overhead imagery—gives birth to a task of shooting such craft from the heavens.

Such a task is problematic. It allows people to deny the inevitability of space-mediated transparency on the battle space under the ill-considered argument that we can eliminate it—all of it—when the time comes. Further, despite the cowboy appeal inherent in "shooting the desperadoes out of the sky," it pushes the armed forces very close to operational doctrine that would, in practice, target everyone else's spacecraft—perhaps appropriate for a third world war, but for no lesser contingency. The "black hull–gray hull" challenge that navies have long faced rarely resolved itself in the injunction to sink all hulls. With satellites so cheap (a simple three-meter capability can soon be purchased for $50 million, no questions asked) and third-party sources so ubiquitous, it will be well-nigh impossible to find out where the bits are being picked up, how they are being sluiced from satellite to satellite, or even which portal or switch in the self-healing global phone or internet system takes them to their destination.

With proliferation, weapons of mass destruction and disruption become strategic equalizers potentially available to any flyspeck nation.

Instead of preening for pointless battle, Air Force Space Command ought to pick up its mantle as the premier information force in the world. Virtually everything it owns exists to foster battle-space awareness, connectivity, and strategic intelligence. That understood, the Space Command of the Air Force would be pushing its data as the firmament that makes sense of all other sensors' attempts to paint the battle space. Working under an infospheric Air Force, the command would not have to be asked twice. Conversely, an atmospheric Space Command, by making short shrift of its information role, risks losing top sight to an emerging ground-based cacophony of small remotely piloted vehicles, high-altitude

"pseudolites," and ground sensors. These should all be interactive elements in the metasystem rather than being expedient acquisitions undertaken without a metasystem vision or architecture.

The same holds true for space-acquisition issues. Should the Air Force pursue a transatmospheric vehicle (TAV)? If it seeks to put a pilot in charge, the quest may prove quixotic; there is no medium up there from which to execute the Hans Solo flights of fancy that air permits. Yet, if the TAV is understood as a radically cheap way to get a pound into orbit, it opens up a wide variety of vistas, not the least of which are for the proliferation of information and top sight.

Third, the Air Force must become the planet's foremost expert on coping with delivered weapons of mass destruction, which used to separate the professionals in the geostrategic big league from the amateurs in the farm clubs. With proliferation, weapons of mass destruction and disruption become strategic equalizers potentially available to any flyspeck nation, as retired Air Force general Larry D. Welch has pointed out. The cheapest and most insidious are weapons of mass-information destruction. Close behind are biological weapons capable of being delivered by very small, sensor-evading vehicles. Overseas, they render ports and staging bases unusable for a deployment. But they could also hold the American homeland at risk. The threat might come from a ballistic missile—a benign space-launch vehicle modified by hostile will—or from a cruise missile launched from a shipborne container. The capability to touch the American homeland may be such a strategic equalizer that the risks of blackmail and checkmate rise as weapons and means of delivery proliferate. Who better to defend the homeland than the people who build the metasystem that alerts us to hostile will in actuation?

Some form of active strategic defense must become a competency that air and space forces pursue. The former Strategic Defense Initiative Office gave every service a piece; with the Soviets gone, the tough issue of "who's really in charge?" can and must be revisited. Nuclear weapons are no less awesome under a different paint scheme. To argue that a temporary absence of hostile wills lets us ignore hostile means is to forget the value of long-range planning over threat-of-the-moment programming. The dismal prospect of a "peer competitor," although not yet true, may, unless we contemplate it, become a 2015 or 2025 fact. Ignoring facts, as we have said, is a problem. Thus, tomorrow's Air Force must posture itself to command the "high ground" in a very real sense. The high ground is the "infosphere," not the atmosphere or the aerospace. To the high ground's metasystem of knowledge must be added the joint-force wherewithal to engage everything an enemy values below.

Tomorrow's Airman Redefined

Central to a redefinition of the Air Force is what it means to be an airman. In World War II, a high percentage of all airmen were subject to risk as aircrewmen. Today's Air Force has far fewer but more efficiently manned aircraft; further, no more than 1 percent of those aircraft can be in the air at any one time. Upon how thin a base of pilots at risk can the Air Force rest? Yet, what would substitute as self-definition in an infospheric Air Force?

How have other services coped with similar requirements for change? The Army, heavy and difficult to move, has no choice other than staying with the "getting ready to get ready" template for combat, consistent with the traditional cycle of initial response, buildup, counterattack, and consolidation. Perhaps the digitized Army converts tanks into interactive simulators for "virtual mission rehearsal" during the long, slow ride to "buildup"—or perhaps the short work that transparency makes of tanks may be too frightening to contemplate. Either way, armor constitutes the skin rather than soul of the Army. At its heart is its self-definition as the will of the American people made manifest in force; this force, in turn, is expressed by being on scene—today in a real context, but over time also in a virtual one. The Marines have gone further than the Army in shedding weight: tanks are a burden that light, lethal, and agile forces may aim to shun. They will

ride into the future on a self-definition that draws on the chaotic and complex context in which they work their craft. A marine is a human transformed into the transcendent rifleman. A marine strives to be nothing more nor less than a marine. Similarly, the Navy will understand what transparency can do to the surface fleet. Yet, it was and is wedded to the sea before it is wedded to any instrumentality of mastering it. To command the seas and engage adversaries "from the sea" is not necessarily to exert power with mass but to exert discrimination with energy—the medium remains the message for the Navy.

Central to a redefinition of the Air Force is what it means to be an airman. . . . Upon how thin a base of pilots at risk can the Air Force rest?

What then of the Air Force? Habituated to being the willful, rebellious little sibling of the Army, the Air Force found it difficult to change without clinging to the instrument that won it independence. Then came ballistic missiles and the forced welding of *aero* and *space*. Will the even greater evolution to cyberspace—it is really nothing more than that—create a fuss, even though it is absolutely faithful to the vision of airpower's founders? Of course. The combat airman is the last emotional vestige of knighthood, the product of the warrior's quest for one-on-one combat. We breed cranky individualism because we believe, when all is said and done, that warfare really is about LeMay being superior to Khrushchev, or Horner being superior to Saddam. An atmospheric Air Force that seeks a personalized "right stuff" but limits its attainment to rated officers risks an exploitable schism among its various communities—especially as those of us in Nomex are surrounded by those of "them" in battle-dress uniforms or hospital whites or office uniforms. All the while, the keystrokers and technowizards greatly outnumber what some of our leaders seem to believe are the few elite "real" warriors. An infospheric Air Force is inherently based on the teamwork inherent in the construction of the metasystem. Fortunately, the Air Force chief of staff has set a new course: cooperation, teamwork, and an understanding of the Air Force as a system of teams within teams. There is a solid base upon which to build.

The Air Force apex will always be defined as the masters of the medium, but in an infospheric Air Force, the medium of air can yield a bit to the various space media. The notion of the cyberjock grappling with the dynamic exigencies of the metasystem in real time is not yet here; people who stare into the screen rarely have to react in real time with "Tek War" tempo. Yet, as the metasystem becomes increasingly integrated with sensors and weapons, such real-time control will become increasingly possible, and no one who has spent any time with any masters of the game can doubt their acuity.

And if risk defines the apex, consider that as processing power grows and spectrum remains fixed, the ability to illuminate, command, and control the battle space may reintroduce the essentiality of physical presence. Tomorrow's cyberwarrior, strapped to the console; armed with top sight; dedicated to the continuity of illumination; running into the tangible battle space to build, maintain, or enhance the filigrees of the metasystem, will be the very definition of grace under pressure.

Implications for Roles and Missions

Such a transition, however necessary and overdue, cannot be made overnight. It must be carefully planned and delicately engineered. In the interim, someone must remain responsible for selecting the technical solutions necessary to mind the atmospheric store. That used to be the service; increasingly, it is the Joint Requirements Oversight Council. Within the Air Force, beneficial bureaucratic inertia and persistent affection for the manned air-superiority fighter will provide sufficient checks and balances against dizzying change. Moreover, an independent Air Force is

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not an autonomous one. Congress, the Joint Staff, many agencies, and the other services must agree to any new self-definition the Air Force advances. Metasystem architects and builders must be funded by the American national security corporation, which cannot lose its share in commanding the atmospheric market as one of its product divisions comes to a new understanding of the business in which it ought to be engaged. The change we propose is easier to debate than implement, but this is a characteristic of revolutionary change—witness the airplane and the intercontinental ballistic missile. So how should we proceed?

If the Air Force understood itself to be organized, not around the aging technology of flight but the nascent technology of top sight, it might be able to play the continuous roles-and-missions debate in a far more constructive manner. Like any shrewd firm, it would cast off low-information missions in favor of high-information ones, strengthen its core competence, and position itself for vigorous institutional life well into the next century, all the while contributing to fostering jointness without risking its own identity.

The current division of services by media is problematic for the Air Force. Take any given mission. Step 1 in roles and missions is to assign each service responsibility for weapons emerging from its particular medium: ground, sea, or air. Step 2, which breeds hair balls, is to argue that systems emerging from one medium are, of course, superior to systems from another. Service prestige is put on the line in defense of technical characteristics that play randomly across the face of combat. This builds a litigious bureauc-

racy—not an institution. The AirForce, by virtue of its need for theory rather than sentiment as its organizing principle, inevitably puts its coherence rather than endstrength on the line every time such issues arise.

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What should theory say about the Air Force's strategy for missions allocation? Start with the oft-revisited struggle over the "four air forces" in general—and close air support in particular. Declaring that there is but one Air Force and three other services also possessing air arms is to deny the facts and to fuel continuing debate whenever the embers of fact are fanned. Even so, "one" atmospheric Air Force disdains every other service's use of aircraft in general and—when it feels like it—jealously guards the close air support mission in particular. So the institutional Air Force does it, but with very little enthusiasm—using the wrong aircraft, under the wrong command philosophy, and not nearly as quickly or responsively as it could,in spite of the valor of its warriors. Meanwhile, the Army makes do with never-satisfactory coordination mechanisms and then puts all the capabilities it needs in yet another platform for the mission—the helicopter—since the Air Forceallows it no other choice. The answer for the Air Force is obvious: let this mission and its associated equipment go. The Marines have proven that a ground force can supply its own jet-propelled airpower organically. Close air support is a necessary but low-yield and low-information component of warfare—one which contributes very little to top sight and rarely, if ever, has strategic effect. As long as armies fight armies, close air support will be necessary. But it is nowhere written in stone that the Air Force must fulfill this responsibility.

The Air Force stands not before a crossroads but at the edge of a precipice. . . . Only by braving the chasm can the Air Force ascend the other side. The lure of descent is familiar to the aviators struggling to retain control of the force, but so were horse and sail to other services in their day.

A similar debate entails long-range missiles,notably for air defense. These missiles are an Army bailiwick in the US—oft-contested by the Air Force as unwarranted intrusion into the deep battle. Here, the Air Force strategy should be obvious: seek the radars and the fire-control internetting, and leave the missiles to whoever wants to drag them around. It keeps the top sight over the increasingly nonlinear battle space and yields the trigger. True, this split is notional as long as fire control and guidance are intimately connected to specific missiles, but such coupling is precisely the wrong way to establish missile guidance in the future. Why could not a Pave Paws radar or an Aegis radar guide a Patriot missile as well as a Patriot radar can? Ultimately, the metasystem informs the firing-control mechanism, and the Air Force, if it issmart, will put first claims on the metasystem as the core of the military's information machine.

Today's roles-and-missions debates seem to look back to the last few days of February 1991. Let others win by that criteria. Instead,look ahead and make claims based on what 2015 or 2025 portends—a global battle space reapportioned by the microsecond. It is a short hop to extend the Air Force's acknowledged claim to tactical-missile-defense battlemanagement to overall cognizance of the entire complex information flow required to shoot down another missile. No longer should the Army, Navy, and Air Force

take three poorly coordinated approaches—each firing from its own medium. Again, an atmospheric Air Force jealously guards its claim to the right firing platform; an infospheric Air Force goes for the jewels.

If the Air Force wishes to contend with other services over platforms, the way to do it is not to waste time arguing over one or another medium but lay claim to the information-rich components: the Longbow, the Guardrail, the Hawkeye, and—why not some day—the Aegis battle system (and, yes, it matters little who actually drives the vehicles compared to who works the operational controls and architectures).

An infospheric Air Force can also take the lead in maturing our understanding of information operations. An infospheric Air Force realizes that A-2 (intelligence) and A-6 (computers and communications) can no longer reside in their own little stovepipes separated from A-3 (operations). The transition from an atmospheric to an infospheric Air Force will also give long-term planners in a newly created A-5 at least five years of work to do, examining every aspect of the force and seeing where it fits into the new structure.

A related issue entails what the Air Force should keep organic rather than slough off to the private sector. An atmospheric Air Force retains its air base orientation, and the result, plain to see, is the retention of so much ancillary functionality that it has far more nurses than operators, with nearly 20 percent of the total Air Force in the health professions. The military's ability to command large forces in single-minded pursuit of worthy aims must be retained. Yet, an infospheric Air Force would ask which elements need to be military to ensure continuity of information and command operations under stress. It would carefully review the current practice of outsourcing technical wizardry lest it be forced to go without in-theater, as metasystems are racked with battlefield stress compounded with new forms of information warfare.

Conclusions

We fully expect that change will be tortuous and torturous. We also know that "without vision, the people perish." The Air Force stands not before a crossroads but at the edge of a precipice. To affix its affections, theory, and force structures exclusively to aircraft transporting mass to targets is to slide forward into the abyss. Only by braving the chasm can the Air Force ascend the other side. The lure of descent is familiar to the aviators struggling to retain control of the force, but so were horse and sail to other services in their day.

Will the Air Force fly across like Daedalus or drop like Icarus? If folly is chosen, count on it being proclaimed wisdom. Yet, the inexorable march of contingency leads to one of two outcomes. The better outcome is for splinter groups to arise and chip off Air Force missions piecemeal, leaving the institution a withering core. The worse outcome is for the ideology of the atmosphere to withstand all challenge, alienating people who see the future with the clarity it presents—until the Air Force wakes up to find the revolution grasped firmly abroad by those with few tears left for it. Either way, if the Air Force fails—in doing our nation and our allies the favor of succeeding—we leave it to historians of the next century to discover the answer to our final question: Why did the Air Force—given the choice of living in fame or going down in flame, as posed in its own song—choose descent and demise?

The leap from an atmospheric to an infospheric Air Force is the next logical step, as paradoxical as it may seem. Air forces have always capitalized on speed, range, freedom of maneuver, and vantage that their medium provides. Yet, nothing travels faster than information. Nothing impedes the distances that knowledge can travel. Nothing makes movement more intelligent, economical, and fruitful than information. And nothing would provide the vantage that a metasystem provides. Atmospheric solutions sufficed until technology permitted multiple solutions from any medium. The metasystem, however,

demands an integration of exoatmospheric components with those provided from the air and the surface. This is not the vision or role that the Army, Navy, and Marine Corps are in a natural position to advance on—although they may lay claim to bits and pieces, thereby frustrating the larger aim. This opportunity is the Air Force's to lose. Done properly, the issue becomes not so much "What is the future of the Air Force?" but "What is the Air Force of the future?" [2] □

Notes

1. See Nicholas Negroponte, *Being Digital* (New York: Knopf, 1995).

2. These questions are paraphrases of Alvin and Heidi Toffler's questions about the economy.